

14th Annual
**Student
Research
Forum**

April 22, 2005

Centenary
COLLEGE OF LOUISIANA

14th Annual
**Student
Research
Forum**

April 22, 2005

Posters

Carlile Auditorium
(Mickle Hall first floor)
12:15 – 1:00 PM

Social Sciences

Kilpatrick Auditorium
(Smith Building)
1:25 – 2:40 PM

Humanities

Kilpatrick Auditorium
(Smith Building)
3:00 – 4:20 PM

Natural Sciences

Carlile Auditorium
(Mickle Hall 114)
1:55 – 4:20 PM

Sponsored by

CENTENARY BOOK BAZAAR
PROVOST AND DEAN OF THE COLLEGE

Judges

DR. DAVID BIELER

DR. SCOTT CHIRHART

DR. ROSS SMITH

DR. MATTHEW WEEKS

From the Director

Thank you research participants and advisers for doing the projects and presenting your work in this forum. This is one of our largest forums.

Judges, thank you for your effort and time.

Special thanks is expressed to the Centenary Book Bazaar for its financial support. We really appreciate it!

A sincere thanks is given to the Provost and Dean of Centenary, Dr. Darrel Colson, for all of his financial support, encouragement, selection of judges, etc.

Thank you Ms. Jeannie Clements, Office of the Provost, and Ms. Peggy Cooper, Office of Public Relations, for all of your work on planning the forum, designing/producing the brochure and the T-shirts, room arrangements, refreshments, etc. You are the best and much of our success is credited to you!

DR. ALFRED MCKINNEY, DIRECTOR
14TH ANNUAL STUDENT RESEARCH FORUM

Poster Presentations

Mickle Hall (first floor)

Allen, Beth	Biology
Dickson, Addie	Chemistry
Hauser, C. Sean	Biology
Jackson, Emily	Health and Exercise Science
Koehn, Lauren	Health and Exercise Science
Kowaleski, Lory	Health and Exercise Science

Social Sciences

Kilpatrick Auditorium

1:25 P.M.	Provost Darrel Colson	Introduction/Welcome
1:30 P.M.	Bowman, Sarah	Economics
1:40 P.M.	Clarke, Greg	Economics
1:50 P.M.	Elrod, Aaron	Economics
2:00 P.M.	Jin, Henry	Finance
2:10 P.M.	Primeaux, Erin	Psychology
2:20 P.M.	Sasseen, Brantley	Political Science
2:30 P.M.	Willis, Katherine.	Business

Break

2:40 – 3:00 P.M.

Humanities

Kilpatrick Auditorium

3:00 P.M.	Coody, Elizabeth	English
3:10 P.M.	Greenwood, Mary	Music
3:20 P.M.	Lewis, Alanna	English
3:30 P.M.	Morgan, Laura	Interdisciplinary
3:40 P.M.	Reid, Ryan	Religious Studies
3:50 P.M.	Sasseen, Brantley	New Media Studies
4:00 P.M.	Saucier, Megan	Religious Studies
4:10 P.M.	Morgan, Laura	Religious Studies

Natural Sciences

Carlile Auditorium

1:55 P.M.	Provost Darrel Colson	Introduction/Welcome
2:00 P.M.	Williams, Sammy	Chemistry
2:10 P.M.	Batte, Catherine	Physics
2:20 P.M.	Boyce, Jonathan	Chemistry
2:30 P.M.	Hauser, C. Sean	Physics
2:40 P.M.	Lawrence, April	Physics
2:50 P.M.	Mai, Nick	LSU Health Science Center

Break

3 – 3:20 P.M.

3:20 P.M.	Mantooth, Ashlee	Chemistry
3:30 P.M.	Millet, Lacey	Biology
3:40 P.M.	Robertson, Taylor	Biology
3:50 P.M.	Stevison, Laurie	Biology
4:00 P.M.	Virdell, Lindsey	Biology
4:10 P.M.	Dent, Jonny	Chemistry

The Effect of Yck Phosphorylation of SEC4 on Vesicle Fusion With the Plasma Membrane

Beth Allen*

Dr. Cynthia J. Brame

Dr. Lucy C. Robinson

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DR. LUCY C. ROBINSON

The Yck1,2 proteins are membrane-associated casein kinase 1 protein kinases in yeast that regulate cytokinesis and membrane protein internalization and trafficking. Very few Yck kinase substrates are known. We therefore sought to identify potential Yck substrates via mass spectrometry. Sec4, a protein which regulates vesicle docking at the membrane, was identified as a potential substrate. In this project, we investigated the impact of the phosphorylation at identified sites of Sec4 on the function of *Sec4*. We isolated the SEC4 gene from the yeast genome, induced mutations in the two identified sites of phosphorylation, and replaced the mutant genes into the yeast genome. We observed no difference in growth in mutant and wildtype strains, but we did observe a decrease in the rate of vesicle delivery to the plasma membrane in the mutant strains, suggesting that Yck phosphorylation of *Sec4* is required for optimal activity. We also isolated and cloned the *Sec4* open reading frame into an expression vector that adds an HA epitope tag to the proteins to allow for a direct assay of Sec4 phosphorylation by Yck1,2. We will use this construct in future experiments to further characterize both the function of Sec4 phosphorylation and the status of Sec4 as a direct target of Yck1,2 protein kinases.

A Comparison of Telomerase Activity in Long- and Short-lived Avian Species

Addie Dickson*
Radmila Hrdlickova
Jiri Nehyba
H. R. Bose, Jr.

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DR. H. R. BOSE, JR.

SECTION OF MOLECULAR GENETICS AND MICROBIOLOGY

SCHOOL OF BIOLOGICAL SCIENCES

UNIVERSITY OF TEXAS AT AUSTIN

A progressive shortening of telomeres leads to replicative senescence in eukaryotic cells. Telomerase is the enzyme employed by certain cells to extend telomeres, thus allowing them to escape senescence. The enzyme's activity is attributed to its catalytic subunit, telomerase reverse transcriptase (TERT). Profiles of TERT expression and telomerase activity have been established for long- and short-lived mammals such as humans and mice, respectively, and here we present profiles of two avian species, one long-lived (chicken) and one short-lived (quail). Using the telomere repeat amplification protocol to measure telomerase activity, we observed that telomerase activity in chicken embryonic fibroblasts decreased throughout subsequent *in vitro* passages, while activity in quail embryonic fibroblasts remained constant. Somatic and germ-line tissues of adult quail universally displayed more telomerase activity than chicken tissues. Sequence analysis of quail TERT and chicken TERT transcripts revealed high homology; however, the different alternative splicing patterns observed suggest that alternative splicing may serve to down-regulate telomerase activity in long-lived homeotherms. The patterns of telomerase activity and regulation observed in chickens and quails parallel patterns seen in humans and mice, thus we suggest that they may serve as a general paradigm for telomerase expression in long- and short-lived homeotherms as a whole.

Effects of Environmental Flow Rate on the Upper Critical Temperature of the Mosquitofish *Gambusia affinis*

C. Sean Hauser

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This project was designed to determine the relationship between acclimation temperature and the upper and lower critical temperatures of the mosquitofish *Gambusia affinis* in environments with and without current. The mosquitofish is an environmentally important species because of its role as a pest controller, and critical temperature studies of this species can impact the range of its dispersal. It was hypothesized there would be an increase in the upper critical temperature and a decrease in the lower critical temperatures in environments with current. The project was conducted by subjecting three groups of 11 fish to three acclimation temperatures for 36 hours, after which the groups' upper and lower critical temperatures were measured. An increase in the upper and lower critical temperatures was observed in the samples subjected to a current when compared to the control group.

The Effects of Visual Cues on Physical Performance

Emily B. Jackson

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The purpose of this study was to determine the effects of different visual cues on physical performance among athletes, non-athletes and gender, respectively. The information gathered from this research might help to predict which children would become successful athletes. The following hypotheses were analyzed in this study: 1) There will not be a significant difference in mean score of the male athletes versus the male non-athletes; 2) There will not be a significant difference in mean score of the female athletes versus the female non-athletes; 3) There will not be a significant difference in mean score of the male athletes versus the female athletes; 4) There will not be a significant difference in mean score of the male non-athlete versus the female non-athletes. The three tests that the subjects performed in order were drawing a circle, distance perception jump and stork stand,

respectively. When comparing the circle drawing task, males performed better when given mirrored visual cues when compared with no visual cues. Females performed better when allowed normal visual cues when compared to both no visual cues and mirrored visual cues. When comparing the distance perception jump with normal visual cues, the athletes performed better than the non-athletes; however, with no visual cues non-athletes performed better than athletes. When comparing the stork stand with normal visual cues, male non-athletes performed better than non-athletes. Similarly, when given mirrored visual cues, female non-athletes performed better than female athletes.

The Effects of a First-Time Strength Training Program on Windmill Pitching Velocity According to Different Body Types

Lauren A. Koehn

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This study investigated the effects of a first-time strength training program on windmill pitching velocity over time. Furthermore, the study examined if these effects differ between windmill pitchers with different body types. There were three participants: a control, an ectomorph, and a mesomorph (with body types classified according to a standardized test). Using a radar gun, the pitching velocities of the three pitchers were measured on three different occasions: before the specific strength training program began, 6 weeks into the program, and 12 weeks into the program.

Statistical analysis was used to compare the differences in velocities over the 12-week lifting period for each pitcher. The results demonstrated a significant decrease in the average pitch velocity for the ectomorph through the 12 weeks. There was also a significant decrease in the average pitch velocity for the mesomorph, but only in the first 6 weeks. Results were discussed in relation to creating specific strength-building programs for pitchers according to their different body types.

The Effects of Muscle Fatigue and Soreness On an Overhand Thrown Softball

Lory Kowaleski

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This study investigated the effects of muscle fatigue and muscle soreness on the velocity of the overhand throwing of a softball at a distance of sixty feet. Ten members of the Centenary College Softball Team were used as subjects of the study. Before the beginning of the weight lifting program a control was taken by allowing the subjects to warm-up for five minutes before throwing the ball three times from home plate to first base. The testing was conducted over a four week time period, and measured with a radar gun. In order to calculate how muscle fatigue might affect the velocity of the throw, a testing session was conducted on the same day that the subject participated in a weight lifting program. To measure the effect of muscle soreness on throwing, a testing session was conducted the day after the subjects participated in a weight lifting program. Due to injuries and other conditions accurate results were obtained for only two of the subjects. The results indicated that when there was an increase in both the amount of weight lifted and repetitions associated with reported muscle fatigue and soreness the subjects exhibited a decrease in the velocity of a thrown ball. When a weight lifting session had no increases in both weight lifted and repetitions the results indicated that the throwing velocities remained static and in some cases increased.

Social Sciences

Determinants of Corn Prices: What Determines What We Pay for Our Food?

Sarah Bowman

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Agricultural output in the United States has grown dramatically since the conclusion of World War II. With this increase in output has also come changes in agricultural prices. An empirical model of the determination of prices of corn is used to attempt to better understand these prices. There are several variables that may be impacting the price of corn. Personal disposable income and the interest rate are included to capture the economic conditions. Farm level costs are also included, such as amount spent on fertilizers and soil conditioners, amount spend on fuel, lube, and electricity, and general farm overhead. As well, the amount spend on hired labor, repairs, and seed are also included. In order to measure the impact of substitute goods, the average price of wheat and of rice are included.

Festival Economics: The Case of the Red River Revel

Gregory D. Clarke*
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Arts and crafts festivals are common occurrences in America. These festivals are a combination of arts, entertainment and concessions. The festivals themselves are often non-profit and must generate revenues through concession sales. In today's market it is vitally important that festivals operate efficiently to cover their costs.

One very successful festival held yearly in Shreveport, Louisiana is the Red River Revel Arts and Crafts Festival. The eight day long Revel features the works of hundreds of artists in addition to live nightly musical entertainment. Though the Revel charges a mod-

est admission fee, its primary revenue source is concession sales. Concessions, which are purchased with 'Revel Coupons', include soft drinks, beer and food. Anecdotal evidence argues that hourly coupon sales are dependent upon many things, which may include, but not limited to: the temperature, presence or likelihood of rain and the admission fee.

This estimates a demand function for hourly coupon sales at the Revel. The data set includes figures from 1995 through 2004. The results of this econometric work have obvious policy implications for those responsible for the day-to-day running of the Revel, while also being of interest to the economist conducting research on similar topics.

The *Bosman* Decision: An Examination of Firm Level Effects (2001-2002)

Aaron Elrod

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The Fédération Internationale de Football Association (FIFA) is the international governing body of football (soccer). FIFA has five regional divisions, known as confederations. The Union des Associations Européennes de Football (UEFA) is the confederation for Europe. Among the rules established by the UEFA were restrictions concerning roster composition, particularly with respect to nationality.

In 1996, the European Court of Justice (ECJ) made a landmark ruling in a 1990 case brought by a player, Jean-Marc Bosman. In this case the court found that the nationality rules violated Article 48 of the EU competition laws, which provides for the free movement of workers across the borders of member states. The ECJ also cited violations of Article 85, which prohibits restraints on market competition, and of Article 86, which prohibits taking advantage of workers. UEFA subsequently renounced its rule restricting how many foreign nationals could be on a roster.

This work first takes a brief look into the case involving Jean-Marc Bosman. Second, this work uses available data for one season (2001-2002) and analyzes the affect that foreign players had on each club's attendance. Finally, the affects that the decision has had on the market are briefly discussed.

Individual Income and Business Tax: To Be or Not To Be?

Yao “Henry” Jin

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The Chinese economy had seen many drastic changes in the past decades. As with each step along the economy’s evolution, the Chinese tax system had to adapt as well. This paper attempts to examine the current Chinese individual income tax system in place and point out some of its peculiarities which are absent or handled differently in the United States tax code.

Altering Need For Cognitive Closure

Erin Primeaux* and Amy Larsen*

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This study was designed to investigate to what extent Need for Cognitive Closure (NFC) can be altered. Participants consisted of roughly 60 college students. NFC is defined as orientation towards “an answer on a given topic, any answer, . . . compared to confusion and ambiguity,” (Kruglanski, 1990 p.337). NFC has also been shown to correlate with political conservatism. We hypothesize that people induced with closed thought will indicate high NFC, and those induced with open thought will show lower NFC. We induce closed and open thought by proposing a political scenario and asking participants to write a paragraph defending a decision they made as a political figure. In the closed condition the decision was a quick one yielding short-term but more immediate results. In the open condition the decision resulted in a less immediate more expensive and long-term solution. Confirmation of these hypotheses will support the notion that NFC has a situational component. Because NFC has been shown to have a relationship with politics, the implications in elections could be immense. Political actors could manipulate the situational component of NFC in favor of their candidate via election advertising; thus enhancing their persuasive electioneering tactics.

Freeing the Free Flow of Digital Information

Brantley Sasseen

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The Digital Millennium Copyright Act of 1998 has been applied to limit the rights of creative artists and restrict the free-flowing nature of new media despite its inclusion of descriptions that would indicate the opposite. This study attempts to measure the impact that this act and its subsequent responses have had on emergent technologies by employing a model of multi-variable impact analysis. This model identifies a number of various populations consisting of organizations that have been involved in the highly interactive process of drafting and responding to the DMCA. The study includes an exhaustive literature review of the major primary and secondary sources. Additionally, the study provides a legislative history and chronological explanation of the impact exerted by the events and responses that both led up to and followed the enactment of the final text of the DMCA. A number of subsequent federal court cases involving the DMCA have been brought, and these cases are discussed in detail. Some conclusory findings and suppositions are provided in the final section of the study.

Where Do I Fit In? Exploring Adjustment Issues Experienced by Children of Expatriate Employees in Shanghai, China

Katherine Willis*

Kelly P. Weeks

Matthew Weeks

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As globalization continues, companies should be more interested in how to help expatriate employees adapt in foreign cultures so that they can be successful in completing their assignments. An often overlooked component of this adaptation is the family of the expatriate. Recently there has been an interest in understanding the adjustment of spouses of expatriates, but there is still a lack of

research concerning children of the expatriates. The current study seeks to identify key issues that adolescents deal with when moved to a foreign country for their parents' employment. Through in-depth interviews, the authors have constructed an initial model which shows that the issues adolescents are dealing with are different than those of their parents. Recommendations are made to help companies integrate adolescents into effective pre-departure training so that the whole family will adjust well and subsequently help the expatriate be able to focus on the assignment at hand.

Humanities

XIV, The Frames, the Forms and the Falling Stars: From Zora Neale Hurston's "The Eatonville Anthology"

Elizabeth Rae Coody

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Where academics place Zora Neale Hurston in the literary pantheon depends on her race, her locale, her time, and her sex, yet somehow she defies these classifications. There are certain sets of expectations for a Southern, African-American woman writing during the peak of the Harlem Renaissance — none of which Hurston herself comfortably assumes. By exploring the tensions, style, and position of XIV, a short tale out of "The Eatonville Anthology" (1926), I will demonstrate the fight within Hurston's image and her motivations. Her desire to capture the oral culture of the rural South seems to consume her political or philosophical reservations. She embodies the orality of this community she seeks to represent in XIV through universality, time, and sound. While exploring the pieces of reality we unwittingly construct about Hurston and her work, we at least open the possibility of reassessing this bizarre and flamboyant player in our American, twentieth-century culture.

More information can be obtained through the "Independent Study" link on my website: <http://personal.centenary.edu/~ecoody>

Composing the Woman's Voice: Elliott Carter's settings of Elizabeth Bishop poetry

Mary Greenwood

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Elliott Carter composed the song cycle *A Mirror on Which to Dwell* to satisfy a commission from the new music ensemble "Speculum Musicae" in honor of the United States Bicentennial. Since the

piece was commissioned for soprano and chamber ensemble, Carter sought out the works of a female poet, assuming that the speaker of poetry written by a woman would have a woman's voice. Carter found the poetry of Elizabeth Bishop, which often uses minute details to express broad personal truths, extremely compatible to his notoriously complex style of composition.

This paper will reveal ways in which the musical details of Carter's score accentuate the meaning and nuances of Bishop's text in the second song of the cycle, entitled "Argument." This song expresses the plight of two lovers who are separated by "days" and "distance" – words given special emphasis by Bishop, who always places them at the beginning of the line of poetry in which they occur. Carter uses a variety of musical devices (such as pitch, instrumentation, rhythm, etc.) to match the layers of meaning provided by the poet and create a new work with all the expressive power of the original text.

Female Gothic Literature: Supernatural Demonstrations of Corrupt, Patriarchal Power

Alanna Lewis

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This paper analyzes a key literary device, the use of supernatural elements, within Gothic literature written by women across three generations. The Female Gothic utilizes the supernatural to unveil the complexities of identity within patriarchal – and corrupt – society. Through the supernatural, Anne Radcliffe's *The Italian* (1797), George Eliot's *The Lifted Veil* (1859), and Djuna Barnes's *Nightwood* (1936) demonstrate the negative effects that patriarchal power structures have on their disenfranchised characters. Radcliffe explains supernatural occurrences as natural to show that the patriarchy creates the image of unearthliness in order to hide its corrupt, excessive use of power over women. George Eliot leaves her supernatural ambiguous to demonstrate that society's inability to accept individuals who do not meet standardized ideals leaves these "unnatural" misfits unexplainable and, therefore, powerless. Djuna Barnes applies this "ambiguity" to all of the interactions between her marginalized characters, showing that without some empowering, foundational past, her characters' actions defy categorization as either "natural" or "unnatural," leaving them without recourse to a means by which to create an

identity. While the face of the supernatural changes over the three generations, within the Female Gothic the supernatural consistently displays the destruction of the individual by the pervasive power of patriarchal society.

La Mama Lolita

Laura Morgan

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Teen pregnancy is a growing concern in much of South America. In Chile, specifically, this issue has come to a head with the expulsion of pregnant girls from Catholic institutions. Now the Chilean government and both Chilean and foreign NGOs are beginning to take notice. But are they addressing the right issue? I will examine the current situation of teenage pregnancy in Chile, the social and political influences on it, and the current programs in place to address it. I will also present a new public health campaign against teen pregnancy in Chile, taking into account its unique cultural context.

The Curse System of Hoodoo

Ryan Todd Reid

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The folk-magic tradition of Hoodoo is a vital part of life for certain people living mainly within poor rural areas in the American South. The curse system is one of the most important components of Hoodoo. However, westernization appears to pose possible threats to the system. This paper argues that the curse system is necessary for Hoodoo's survival.

Section Two is the review of literary subject matter. The paper looks at how Hoodoo's curse system relates to those of other folk-magic traditions. Next, the paper explores what makes Hoodoo and other traditions actually work. Finally, the threats to similar traditions are studied. If Hoodoo's curse system is very similar to others, then Hoodoo may be susceptible to similar threats.

The project shows that Hoodoo's curse system is a necessary com-

ponent and ensures the survival of Hoodoo. If the curse system were to be lost to the tradition, then Hoodoo practitioners would lose the basis of their practice and be unable to provide alternative assistance to those who cannot afford modern Western medical treatment, psychological treatment, or other care.

New Media and Posthumanism or the Mechanical Logic of Mediated Virguality Information Technology Studies

Brantley Sasseen

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The primary purposes of this project are: 1) to explore the development of new media theory; and 2) to posit an understanding of a new, posthumanist theory that has arisen as a result of this development. The work done with regard to the development of new media is largely based in the body of literature presented in the New Media Reader from MIT Press. This study explores the ways in which new media theory addresses how reality and simulation take on new meanings because of the constantly mediated experiences that individuals have within their everyday lives. The second part of the project is primarily based in the seminal work by N. Katherine Hayles on the posthuman subject, *How We Became Posthuman*. This section of the project includes examining how social actors adapt to technology limitations and thereby bring into sharp focus basic social processes in human interaction and informing the design of technologies based on theories of language and the requirements of communication dynamics. Additionally, a multimedia project is included in order to reflect both the content and form of the previous two sections of the project.

Forming New Ritual in the United States: Meeting Women's Needs After Abortion, Miscarriage and Stillbirth

Megan J. Saucier

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Women who have experienced abortion, miscarriage, and stillbirth, are largely ignored by religious communities. Many women

undergo great emotional hardship and psychological despair after these experiences. It is the intention of this study to show that women need their religious communities to cope with these experiences, and gain closure. Ritualized mourning rituals are one act that may benefit women who have experienced terminal pregnancies. This study will not debate whether abortion is right or wrong.

Section two reviews the literature on the subject. The study examines a Japanese mourning ritual called Mizuko Kuyo, which mourns aborted, miscarried, and stillborn babies. Mizuko Kuyo serves as a model for new ritual in the United States. Effects of abortion, the relationship between religion and abortion, and ritual theory are discussed. Sections three and four discuss interviews of women who have experienced terminal pregnancies. It appears that women desire a way to remember their children after death.

As this project demonstrates, women do need their religious communities during experiences of terminal pregnancies. Religious communities need to reach out to women who have abortions, miscarriages, and stillborn children by offering a supportive ritual to remember their children. It is clear that this situation cannot be ignored by religious communities any longer.

Women in Islam: a cross-cultural study

Laura Morgan

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When I was seven, my family moved to Bangladesh, a predominantly Muslim country. Even though we lived on a Christian hospital campus, most of my childhood friends were Muslim. They prayed when the “azan” (call to prayer) sounded all over the city, covered their heads in public, and once they were married off sometimes wore “burqas” (full-body coverings). The Bengali Islamic way of life seemed normal to me. On the other hand, I had never read the Koran (even in translation) or spoken to Muslims outside of the Bengali culture. Therefore, the premise of this investigation was to find out more about the teachings of the Koran in relation to women and about how those teachings are put into practice by Islamic women in different cultural contexts. I interviewed five women in Bangladesh and five women here in Shreveport using a set of questions about the daily practice of Islam, the observance of religious traditions, and the special rules

/restrictions for women. I also opened the discussion up to anything they wanted to talk to me about and tried to get a picture of the women's lives in their jobs, schools, homes and families.

Natural Sciences

Isolation of Organic Compounds from *Asclepias* Milkweeds

Sammy Williams*
Dr. Ronald A. Martin

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Cardenolides are a class of C-21 steroids that are commonly found in milkweeds of the genus *Asclepias*. Numerous cardenolide compounds have been used therapeutically, similar to the pharmaceutical cardiac glycosides. Cardenolides can be extracted from milkweed plants, but the extractions must go through many purification tests to isolate a pure cardenolide sample. Organic compounds were extracted from leaves and stems of different species of *Asclepias* plants, and possible cardenolide compounds were isolated by numerous chromatographic methods. Three solid compounds were isolated from *Asclepias latifolia*. One was identified by thin-layer chromatography as Labriformidin. One had properties similar to amyrin, but did not match the gas chromatograph-mass spectra of α - or β -amyrin. The other had physical properties of a wax, but was not studied further.

Thick Tissue Imaging by Fluorescence

Catherine L. Batte

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Currently, fluorescent dyes are widely used for imaging of biological activity. Fluorescent dyes used with thin-tissue samples for microscopy help elucidate many of the structures not visible to the human eye; however, when the volume of the tissue is increased and the scale of biological activity being studied in the tissue is not, a problem arises. The difficulty lies in the fact that most tissues exhibit their own fluorescence. When the volume of the tissue is much larger than the one for the biological activity being studied, the fluorescing tissue overpowers the emission from the dyed

region. This project was designed to determine a method of making thick tissue biological activity of microstructures visible. This project exploits the optical properties of these dyes as a way to get around the problem of overpowering tissue fluorescence.

Specifically, the aim of the project is to visualize thick tissue biological activity of microstructures using a tunable light source, digital camera, and micro CCD software.

Preliminary Studies toward the synthesis of Phorbol esters and Dactyol

Jonathan H. Boyce

RESEARCH ADVISERS:

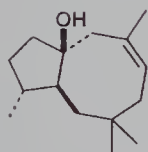
GRAHAM K. MURPHY

FREDERICK G. WEST

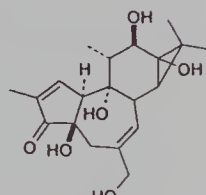
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UNIVERSITY OF ALBERTA

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Dactyol



Phorbol

Phorbol and dactyol contain fused bicyclic ring systems that pose major synthetic challenges in organic chemistry. This project uses oxonium ylide rearrangement chemistry to fuse the [5-7] and [5-8] bicyclic ring systems of both natural products. This is accomplished by generating carbocycles with bridging ethers using Stevens [1,2]-shift of oxonium ylides which are derived from easily prepared cyclic mixed acetals. Sulfur-mediated cleavage of the resulting bridging ethers can be applied under both reductive and basic conditions. This chemistry offers potential for a novel synthesis of both natural products.

Design and Development of an Automated Apparatus to Condense Nitric Oxide

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Nitric oxide (NO) is an important biological molecule that is involved in multiple regulatory roles throughout the body. While there is a great amount of research currently investigating how NO influences these roles, one difficulty is that the methods of NO collection from tissues generate samples of the gas that are not

concentrated enough for accurate quantification. The purpose of this project was to design and develop an apparatus which concentrates low levels of NO over a period of time and then releases one highly concentrated sample that can be quantified accurately. Our proposed approach was to concentrate the gas by condensing it in a small volume, then evaporating it and releasing the sample for detection. The apparatus accomplishes this by condensing the sample in a metal tube that is immersed in liquid nitrogen and then heating the tube to evaporate the collected sample. The released NO sample was detected using gas phase chemiluminescence and mass spectrometry. The project also incorporates the ability for the apparatus to be automated using electronic valves, motors, and heaters.

Automation of an Apparatus Using Visual Basic

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The goal of this project is to design a computer program to completely automate an apparatus currently being designed in the physics department. This program will control the motors and electronic valves of the apparatus and offer the user the option to customize the program with timing and motion options. The valves and motors are connected to two separate parallel ports on the computer which are used for their input/output capabilities. The valves are controlled with a MS-DOS program called LPTOUT.exe downloaded from the internet and a system of circuits. The command is then shelled into Visual Basic to switch the valves between their positions at various times. The motors are controlled with a module that came with the software from Arrick that is incorporated into the Visual Basic program. The module allows the commands created by Arrick to be written into a Visual Basic program. The finished product will be a user-friendly program that will carry out an experiment with the push of a button.

Title: Oxidant Induced Endothelial Cell Barrier Dysfunction Requires Rho Kinase and Myosin Light Chain Activation

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Oxidant stress occurs during processes such as intestinal ischemia reperfusion, organ transplantation and shock and is believed to be in part responsible for the pathophysiology seen clinically in patients with acute lung injury (ALI) and multi-organ dysfunction syndrome (MODS). One elucidated mechanism of oxidant generation involves the anaerobic metabolism of adenosine to hypoxanthine which, when oxidized by xanthine oxidase, is a source of reactive oxygen species (ROS). ROS have been shown previously to cause both local and remote tissue endothelial microvascular barrier dysfunction *in vivo* and *in vitro*. It was previously understood that oxidant stress induces the activation of Rho kinase that causes barrier dysfunction in smooth muscle cells. In our research we tried to further elucidate this pathway. We found that inhibitors of Rho kinase, Y-27632 and H-1152, as well as by ML-7, an inhibitor of MLCK attenuated the effects of oxidants like hydrogen peroxide.

Synthesis of Submicron Fibers for Sensor Applications by Electrospinning

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Electrospinning produces a thin jet of submicron diameter fibers

from a polymer solution with the proper viscosity, conductivity and surface tension by the application of a sufficiently high electric field so that electrostatic forces overcome the surface tension of the solution. These fibers can then serve as high surface area chemical or temperature sensors due to changes in their electrical properties when gases bind at their surface or through changes in the lifetime of a fluorescent dye or phosphor bound to their surface. We have produced a large variety of submicron diameter polymer fibers, as revealed by scanning electron microscopy (SEM), including polyethylene oxide (PEO), polyvinylalcohol (PVA), polyvinylpyrrolidone (PVP), polymethylmethacrylate (PMMA) and polyacrylonitrile (PAN). The PAN fibers have been coated with $[\text{Ru}(\text{Ph}_2\text{phen})_3]\text{Cl}_2$ and are undergoing spectral characterization. We also produced metal oxide fibers of Zn, Sn, Si, Ti, Al and In, some of which are undergoing testing on patterned substrates.

Crab Motor Activity Underlying Locomotion on Land and Underwater.

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Shore crabs regularly accommodate to load changes when freely walking in their two natural environments: on land and underwater. Shore crabs (*Carcinus maenas*) were simultaneously filmed with three high-speed video recorders and implanted with small wire electrodes to record muscle activity. This combined kinematic and electromyography (EMG) study has allowed us to examine differences in walking behavior, muscle activation, and relationships between them under different load conditions. Crabs recruit more units when loaded when able, although animals often only have one unit to recruit and use graded potentials to increase output. The area under the rectified EMG is used as a measure of muscle output, since it is a function of the rate of muscle activation, length of activation, and the sizes of units. This area is larger for crabs walking on land compared to under water. Crabs that are loaded tend to walk slower and have longer burst durations for power stroke bursts. Our data suggest that the freely walking shore crab *Carcinus maenas* adjusts to varying load by increasing the amount of activity in the muscle and possibly down-regulating activation when loaded, meaning that feedback systems adjust so that smaller inputs to the muscle cause a larger response.

Effects of the Naturally Occurring Coumarin Compound, 1'-Acetoxychavicol Acetate, (ACA) on the Invasive Ability of Human Breast Cancer Cells *in vivo*

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The tropical ginger compound, 1'-acetoxychavicol acetate (ACA), possesses cancer chemopreventive properties in several models (oral-mucosa, skin, leukemia, colon). Because ACA's effects on breast cancer are not known, our goal is to determine the effects of ACA on different stages of breast cancer development. To address whether ACA may block tumor progression, our initial studies used human breast cancer adenocarcinoma MDA-MB-231 cells, which are estrogen receptor/progesterone receptor negative and highly invasive. Cells were incubated for 24 h $\pm$ ACA (0.1-10 μ M) on 8 μ m pore transwell inserts coated with Matrigel. ACA blocked invasion of MDA-MB-231 cells into Matrigel with an IC₅₀ of < 2 μ M and ~90% inhibition at 10 μ M. We hypothesized that the anti-invasive effects of ACA may be due to suppression of ornithine decarboxylase (ODC), a putative oncogene up-regulated in virtually all cancers. Following a 6 h incubation we found that ACA suppressed ODC activity in MDA-MB-231 cells by 91%, 87%, and 98% at 10 mM, 25 mM, and 50 mM, respectively. In comparison, invasion was blocked by 98% by 1 μ M α -difluoromethylornithine, a synthetic mechanism-based inactivator of ODC. These results suggest ACA may have potential chemopreventive effects against the later stages of breast cancer.

Title: Characterization of Putative UGT Genes in *Drosophila pseudoobscura*

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In a recent study, genes conferring reinforced mating discrimina-

tion were localized to the fourth chromosome in *Drosophila pseudoobscura*. Sequence analyses suggested this region contains one to three putative UDP glycosyltransferase (UGT) genes that could be functional genes, hybrid genes, pseudogenes, or not present. UGT genes are found in most living organisms and function to transfer glycosyl units from UDP-glycosyl molecules onto molecular toxins, targeting the toxins for excretion from the cell. We hypothesize that the part these genes play in reinforced mating discrimination involves their role in olfaction, which could imply a mechanism for mate choice. To determine the functionality of and characterize these genes in *D. pseudoobscura*, I performed expression analyses followed by a procedure known as Rapid Amplification of cDNA Ends (RACE). RACE attempts to sequence the entire mRNA transcript, allowing for alignment of the mRNA sequence with that of the genomic DNA. This project was able to confirm expression of at least two of the three putative genes and perform a 3' RACE on those genes. The expression of the third gene has yet to be confirmed. The future of this project entails further characterization through 5' RACE and more work with the first and third genes.

Phylogenetic Implications of Mitochondrial-DNA Sequence Variation in Deer Mice from California

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Previous research concluded that *Peromyscus sejugis* was an insular isolate of *P. maniculatus* from Baja California because of a low level of sequence divergence between these populations. To identify the northern geographic extent of the *P. maniculatus* (Baja)/*P. sejugis* haplogroup, we compared sequence variation in ND3/ND4L/ND4 mtDNA region of 38 individuals of *P. maniculatus* from central and northern California to known reference populations. The level of sequence variation reveals a close association between *P. maniculatus* from Baja California and those from Southern California (sequence divergence= 0.80%) and Fresno (divergence= 0.85%). However, comparisons of the *P. maniculatus* from Baja with the individuals from the Johannesburg and Arcata populations resulted in high percent

sequence divergences at 3.92 and 3.76, respectively. Conversely, when *P. maniculatus* from Colorado and Washington were compared to the Johannesburg and Arcata populations, low percent sequence divergences (0.80 and 1.75) were obtained; and when compared with individuals from S. California and Fresno, high divergence values of 4.17% and 3.99% resulted. The northern geographic boundary for the Baja *maniculatus/sejugis* haplotype therefore seems to exist in the region between Arcata and Fresno. These data thus support the assertion that *P. maniculatus* is polyphyletic. Further, this study confirms the sister-group relationship between *P. maniculatus* (Baja, S. California, Fresno)/*P. sejugis* and *P. keeni*.

Effect of Curcumin on Rhabdomyosarcoma Cells

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Curcumin (diferloylmethane), a polyphenol natural product of the plant *Curcuma longa*, has shown its anti-cancer activity in a variety of tumor cells. However, little is known about its effects on rhabdomyosarcoma cells. Also, the anti-cancer mechanism is not well understood. Here we show that curcumin potently inhibited the growth of rhabdomyosarcoma cell lines (Rh1 & Rh30), with IC_{50} ranging from 2-5 μ M. Curcumin also induced apoptosis of the cells in a dose-dependent manner. Exposure to curcumin (20 μ M) for 7 days completely killed cells. Further, curcumin also inhibited the basal or type-I insulin growth factor (IGF-1)-induced motility of cells as detected by a wound-healing assay. Western blot analysis revealed that curcumin inhibits phosphorylation of p70 S6 kinase at Thr389, suggesting that curcumin might execute its anti-cancer activity by blocking the mammalian target of rapamycin (mTOR)-mediated signaling pathway(s).

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